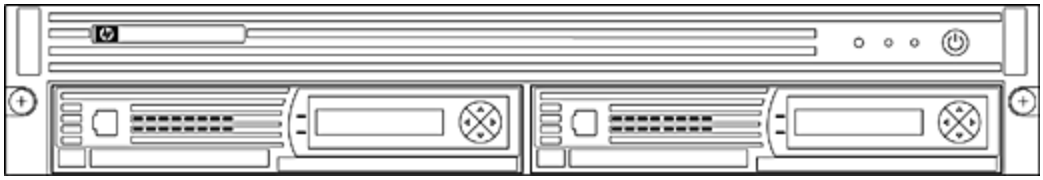
*Overview*



## Models

| | | |
|---|---|---|
| **HP StorageWorks Modular Smart Array 1500 cs** | MSA1500 2U Fibre Channel SAN Attach Controller Shelf | AA986A |
| | MSA1500 2U Fibre Channel SAN Attach Controller Shelf, with SATA<br>**NOTE:** For Americas, Asia Pacific, and Japan. | AD509A |
| | MSA1500 2U Fibre Channel SAN Attach Controller Shelf, with SCSI<br>**NOTE:** For Americas, Asia Pacific, and Japan. | AD510A |

## Introduction

The HP StorageWorks Modular Smart Array 1500 cs is a Fibre Channel SAN attached 2U controller shelf that connects to Serial ATA (SATA) or SCSI disk enclosures. This combination provides customers with a low cost, high capacity storage solution. This solution has been designed as a hardware foundation for which future solutions can be designed and implemented for investment protection. The MSA1500 is perfect for those customers looking for less expensive storage solutions using HP SATA enclosures to store data that doesn't require a high degree of I/O performance and/or is viewed as non-critical to business operations. The MSA1500 with up-to-eight attached SATA enclosures can provide the customer with up to 24 TB (96 - 250 GB SATA disk drives) of raw capacity. If the business needs SCSI reliability then attach up-to-four SCSI enclosures for a raw capacity of 8.1 TB (using 56 - 146 GB SCSI disks). Mixing of SATA and SCSI enclosures are not supported behind the same controller at this time.

The MSA1500 provide 2 Gb Fibre Channel to the hosts. The enclosure provides Ultra3 SCSI connection to the hard drive enclosures.
By utilizing existing SCSI drive enclosures and MSA 1000 controller technology and integrating the use of our lowest cost SATA hard drives and enclosures, the MSA1500 lowers the total cost of ownership and extends the customers hardware investments into the future.
With lower cost of ownership, customers can now take advantage of tiered storage capabilities matching up data with appropriate levels of performance, availability and cost of data storage. The result is lower overall cost without giving up the needs of business applications.

The MSA1500 is a member of the HP StorageWorks Modular Smart Array family, delivering industry-leading technology to meet today's demanding and growing storage needs. These storage solutions offer the best price performance features for direct attach environments and entry-level and mid-range SAN environments. Each solution is designed to maximize transfer rates, reduce management costs, while driving rapid return on investment.

The MSA1500 can be remotely managed by using management tools such as HP Insight Manager, Array Configuration Utility and the HP StorageWorks Fabric Switch Management Utility depending on the host's operating system.

## What's New

- Three new part numbers are being added along with High Availability and Clustering compatibility. The first two part numbers are bundles with SATA and SCSI enclosures with the MSA1500 controller shelf, and the third part number is for a MSA1500 upgrade shelf for those who want to migrate their MSA1000 to the MSA1500

*Overview*

## Key Features

- Advanced Data Guarding (ADG) - Highest level of fault tolerance, allocates two sets of parity data across drives and allows simultaneous write operations, this level of fault tolerance can withstand two simultaneous drive failures without downtime or data loss
- 2 GB/1 GB Fibre connection to host - Supports both 1 Gb and 2 Gb Fibre Channel fabrics to ensure your investment in 1 Gb infrastructure is protected
- High performance controller(s) built on DAS to SAN (DtS) architecture
- Scalable to eight- SATA enclosures for 24 TB or 4- SCSI enclosures for 8.1 TB of storage capacity with 4- dual channel SCSI I/O cards
- Ability to hot plug disk enclosures to the controller shelf
- Hot plug expansion and replacement support - Hot plug expansion and replacement of hard drives, redundant controllers, for simple, fast installation and maintenance. Fans and power supplies are also hot plug replaceable
- Key solution certified for backup and restore, replication, write once read many for disk, media and broadcasting, medical, clustering and archiving

## Customer Benefits

- Low cost, high capacity - For less than $.01 per/MB customers can obtain up to 24 TB of capacity (eight SATA enclosures) using up to 96 - 250 GB SATA disk drives
- Flexibility - Can choose either SATA configuration for secondary storage of data, or SCSI configuration for primary storage, cannot mix SATA and SCSI at this time.
- Ability to utilize a tiered storage approach as data values decrease, choosing the right disk technology for your data storage.
- Investment Protection - the ability to upgrade from the MSA1000 to the MSA1500. Remove the controllers from the MSA1000 and place them into the controller bays in the MSA1500 and upgrade the firmware.

*Family Comparison*

Include a Matrix or chart of speeds/feeds that compare this product to other products in the product family.
The matrix should contain firmware versions, any diagnostic/configuration/troubleshooting etc. software, plus the above comment

| | MSA1500 | MSA1000 | MSA500 |
|---|---|---|---|
| **Announce Date** | 2004 | 2001 | 2001 |
| **Capacity** (Maximum) | 24 TB SATA, 8.1 TB SCSI | 6 TB SCSI | 2 TB SCSI |
| **SCSI Interface** | Ultra 2, Ultra 3 | Ultra 1, Ultra 2, Ultra 3 | Ultra 1, Ultra 2, Ultra 3 |
| **Controller Cache** | 256 MB, upgradeable to 512 MB | 256 MB, upgradeable to 512 MB | 256 MB, upgradeable to 512 MB |
| **Direct or SAN** | SAN Attach - Fibre | SAN Attach - Fibre | Direct Attach - SCSI |
| **Maximum Drives** | 96 SATA, 56 SCSI | 42 SCSI | 14 SCSI |
| **MTBF** | 500,000 w/ SATA @ 20%, 1.5M w/ SCSI @ 100% | 1.5M @ 100% | 1.5M @ 100% |
| **Data Transfer per Drive** | 150 MB/s SATA, 320 MB/s SCSI | 320 MB/s | 320 MB/s |
| **Integrated Switch Option** | No | Yes, Switch or Hub | No |
| **Use for Storage** | Secondary with SATA, Primary with SCSI | Primary Storage | Primary Storage |

*Product Highlights*

**Product Technology**

**Modular Chassis** - The modular design of the MSA1500 controller shelf supports up to eight SATA enclosures on 4 dual channel SCSI I/O cards, or 4 single channel SCSI enclosures, redundant controllers, 2Gb fibre channel I/O modules, fans and power supplies.

**Scalability** - up to 24 TB storage capacity utilizing 96 SATA hard drives and eight SATA enclosures or up to 8 TB storage capacity utilizing 48 SCSI hard drives and four SCSI enclosures.

**Performance** - The MSA1500 and its components have been designed using the latest in standard 2 Gb interconnects and Fibre Channel technology. Performance tests indicate a transmission rate of up to 30,000 IOPs and bandwidth of up to 200 MB per second.

**Advanced Data Guarding (RAID ADG) Fault Tolerance** - This is the highest level of fault tolerance. It allocates two sets of parity data across drives and allows simultaneous write operations. This level of fault tolerance can withstand two simultaneous drive failures without downtime or data loss.

**DtS Architecture** - DtS (Direct Attach to SAN) architecture is an exclusive MSA1000 and MSA1500 feature that provides a quick and easy way to migrate stored data on SCSI disks protected by most Smart Array controllers to a MSA1000 or MSA1500 storage system.

**Pre-Failure Warranty** - Enclosures and hard drives attached to an MSA1500 and monitored under Insight Manager are supported by a Pre-Failure (replacement) Warranty.
**NOTE:** Pre-Failure Warranty allows for the replacement of designated drives in an HP StorageWorks disk enclosure before they actually fail when using Insight Manger.
**NOTE:** Some operating systems may not support all of these features.

**Integrated Configuration and Management Tools** - The MSA1500 utilizes a standard, integrated set of management and utility software. These tools consistently lower the cost of ownership by reducing training and technical expertise necessary to install and maintain the MSA1500.

**Hot Plug Expansion and Replacement Support** - The MSA1500 supports hot plug expansion and replacement of redundant controllers, fans, power supplies, Serial ATA and SCSI disk enclosures, and I/O cards for simple, fast installation and maintenance.

*Software Components*

**Overview**

The MSA1500 utilize a single, consistent set of utility software for storage and RAID management, setup, configuration and troubleshooting. This consistency reduces the cost of ownership by reducing the training and technical expertise necessary to install and maintain your HP storage solution.

**Array Configuration Utility**

- Provides a graphical view of HP drive array configurations
- Easy to use Wizards for configuration
- ACU supports on-line configuration
- Web Based ACU supports On-Line, Remote Web Based and Off-line configuration

**Selective Storage Presentation** (SSP)

- Built-in to the controller firmware and controlled via ACU
- Allows setting of access rights to the MSA1500 storage by hosts
- Access control can be set up to a logical volume level using the Array Controller Utility

**Insight Manager**

- Powerful storage, server and server option management tool
- Monitor storage from a remote central location
- Browser based, provides full access from anywhere on the Intranet, eliminating the need for a dedicated Insight Manager management console

## *Compatibility*

HP's extensive compatibility testing program assures that your HP StorageWorks MSA1500 works with leading servers, operating systems, and backup applications - and not just those sold by HP. The MSA1500 works seamlessly in many environments, making them especially suitable if you have a mixed system environment. For the latest list of servers, workstations, operating systems, and backup software that supports the MSA1500, check the Modular Smart Array compatibility pages on our web site at: http://www.hp.com/go/MSA1500cs

**HP Server Compatibility**

The HP StorageWorks MSA1500 is supported on the following classes of HP systems:

Supports most 32-bit ProLiant servers including BL20p G2, BL40p, DL320, DL320 G2, DL360 G2, DL360 G3, DL380 G2, DL380 G3, DL560, DL580, DL580 G2, DL740, DL760, DL760 G2, ML370 G2, ML370 G3, ML530 G2, ML570, and ML570 G2. Certification of new ProLiant models is ongoing.

Supports most multi-vendor industry standard 32-bit Intel-based (x86) servers.

Supports most 64-bit Integrity

**OS Support**

- Microsoft Server 2003 Enterprise Edition
- Microsoft Server 2003 Standard Edition
- Microsoft Windows 2000 Server
- Microsoft Windows 2000 Advanced Server (sp4)
- Red Hat Linux Enterprise Advanced Server 2.1 and Enterprise Linux 3.0 (32 & 64-bit)
- SuSE Linux SLES 8 (32 & 64-bit )
- Please refer to compatibility matrix at http://www.hp.com/go/msa1500cs for complete configuration support

**Solution Offerings/Software Certifications**

**Clustering**
- Polyserve - Matrix Server for Windows
- HP ServiceGuard for Linux Certification (to be supported in Q3 '04)
- Microsoft Cluster Server
- SteelEye LifeKeeper for Linux Certification (to be supported in Q3 '04)

**Backup and Restore**
- Hewlett Packard Data Protector
- VERITAS Backup Exec and NetBackup
- Legato NetWorker for Windows
- Computer Associates BrightStor Enterprise Backup

**Media and Broadcasting**
- ADIC StorNext for Windows, Linux

**File Retention and Compliance**
- KOM Networks KOMworx

**NOTE:** Supports Write Once Read Many (WORM) on disk.

**HSM**
- CommVault QiNetix Data Migrator

**Database Archiving**
- Princeton Softech Archive for Servers

**Medical Imaging Management**
- Bycast StorageGRID

**Replication**
- HP Storage Mirroring for Windows
- HP Virtual Replicator for Windows

Please refer to Solutions at http://www.hp.com/go/msa1500cs for more information.

## Optional Software

**HP OpenView storage virtual replicator**

Storage Virtual Replicator combines a rich set of innovative capabilities that enhances and simplifies storage management for Windows Server 2003 and Windows 2000 environments. Through virtualization, online volume growth, snapshot and management features, the software complements the standard capabilities within the operating system. HP OpenView Storage Virtual Replicator provides virtualization enabling storage consolidation and capacity provisioning for flexible, simplified storage management on Windows based servers.

- **Virtualization** - multiple storage arrays can be consolidated into a pool of disk space for individual systems to use. Multiple virtual disks, up to 2 terabyte in size, can be created from a pool for users and their applications. Existing storage units with production data can be imported into a pool. The data partition is preserved as a virtual disk and unused capacity is added to the pool.
- **Online volume growth** - Enables easy, non-disruptive growth for Windows 2000 or and Windows Server 2003 with zero downtime. Allows a system administrator to grow an existing volume on virtual disks and Windows 2000 basic disk. The system will remain online, and the data on the volume will remain intact.
- **Snapshots** - Instant, point-in-time snapshots for backup, online restore, testing or data mining. Enable instant creation of multipurpose virtual replicas of production data without the requirement of a physical copy Snapshots identical to ordinary physical disks, with both read and write capability. Snapshots can remain online for restore operations, testing, and data mining. Full interoperability with the Windows Server 2003 Volume Shadow-copy Service (VSS).
- Command line interface for scripting

Please refer to the Optional Software section of this document or visit http://www.hp.com/go/MSA1500cs for additional details.

---

**HP StorageWorks Secure Path**

HP StorageWorks Secure Path is a family of high availability multi-pathing software products providing continuous data access from the HP RAID Array to host servers running the Windows Server 2003, Windows 2000, and Linux operating systems.
Redundant hardware, advanced RAID technology and Secure Path's automated failover capability are used to enhance fault tolerance and availability. Secure Path effectively eliminates controllers, disk drives, interconnect hardware and host bus adapters as single points of failure in the storage subsystem.
The attachment of non-Secure Path (single HBA) servers to an MSA1500 with dual controllers that has servers with Secure Path (dual HBA) attached is supported where the operating systems are Windows or NetWare. Users must realize that in event of a controller fail-over (failure of active controller) the single path servers will lose access to their data on the MSA1500.

**NOTE:** If Secure Path for Linux is used on any node attached to an MSA1500, all nodes must also have Secure Path installed, regardless of operating systems.

**NOTE:** refer to http://www.hp.com/go/securepath for the latest Secure Path parameters.

**Key Features**

- Maintains connections to storage
- Monitors I/O paths and alerts on significant events
- Used in Stand alone Configurations, Cluster Configurations, and SAN configurations

---

## Compatibility

**MSA1500 Clustering**

Clustering is rapidly gaining in popularity, as users desire a high level of data availability. Many of the old cluster restrictions that were the product of both hardware and operating systems have been overcome. While there still remain configuration limits, the result is a new high degree of flexibility both in number of clusters, mixing clusters with single nodes, and the integration of dissimilar operating systems.
For example you may mix three Microsoft (Windows Server 2003, Windows 2000, or Windows NT) clusters and other individual servers, even doing so in a heterogeneous server operating system environment. Windows Server 2003 allows a single cluster of up to eight nodes, now with Secure Path protection.

Presently a Linux/Secure Path configuration is limited to a two-node cluster. Refer to http://www.hp.com/go/securepath for any restriction on Linux with Secure Path.
The MSA1500 has the ability to be configured with thirty-two LUNs. Best practices would dictate generally no more than sixteen servers accessing a single MSA1500. More commonly, users have had an average of five to eight nodes. This can be any combination of hosts with different operating systems while holding fast to the guidelines and limits described in the above paragraphs. Performance within these guidelines is heavily dependent on the actual number of end users and types of applications being employed.
For more information, click on the link: http://www.hp.com/enterprise/highavailability/index.html

---

**HP ProLiant Cluster HA/F200 for MSA1500 (Microsoft)**

The ProLiant Cluster HA/F200 for MSA1500 uses HP's industry-leading ProLiant servers, HP StorageWorks Modular Smart Array 1500, Ethernet server to server interconnect, and HP's industry-leading installation and systems management utilities.
The ProLiant Cluster HA/F200 for MSA1500 kit delivers a higher level of availability in cluster environments by enabling multi-path Fibre Channel connections. Secure Path management software, included with the kit, features support for a redundant Fibre Channel infrastructure (two paths through the Fibre Channel hub or Fabric Switch) utilizing dual Host Bus Adapters in each server connected to one or more MSA1500, each with dual RAID controllers.
Tested configurations:

- Up to four (4) heterogeneous/homogeneous clusters per SAN (e.g., 2-node, 4 node, 8-node depending on OS version limitations)
- Up to ten (10) MSA1500's per SAN
- Heterogeneous OS's (W2K, W2K3, Linux); cluster size is OS dependent (e.g., 4 node for W2K, Linux)
- Cluster nodes can attach to up to two (2) MSA1500's
- Available now for Windows Server 2003, and Windows 2000.

HP ProLiant Cluster HA/F200 for MSA (Microsoft) 252409-B24

---

**HP ProLiant Cluster HA/F100 for MSA1500 (Microsoft)**

The ProLiant Cluster HA/F100 for MSA1500 is a robust, integrated cluster solution providing high availability for applications and data in business-critical environments. An ideal platform for business-critical databases, large business applications, email or file/print services, the ProLiant Cluster HA/F100 for MSA1500 offers Fibre Channel-based clustering at a fraction of the cost of proprietary cluster solutions.
The ProLiant Cluster HA/F100 for MSA1500 exploits HP's industry-leading servers, HP StorageWorks Modular Smart Array 1500, Ethernet interconnect and HP's leading installation and systems management utilities. Enterprise Edition, and Microsoft Windows 2000 Advanced Server.
Available now for Windows Server 2003, and Windows 2000.

HP ProLiant Cluster HA/F100 for MSA (Microsoft) 252408-B24

---

*Compatibility*

**HP ProLiant Parallel Database Clusters for Oracle on MSA1000**

The HP Parallel Database Clusters (PDC) for Windows and Linux provide the industry's leading platform for deployment of Oracle 9i Real Application Clusters. The PDC is a multi-node (up to six in Microsoft environments and up to four with Linux)) shared-storage clustering environment that enables industry standard Windows and Linux platforms to deliver performance previously limited to very large SMP (16 to 32 processor) environments. Every server node in the cluster has concurrent read-write access to the common shared database residing on the MSA1500 storage SAN. The multi-node architecture is inherently highly available, loss of any single node results in some degradation of performance but the database remains active and accessible. When optimally integrated with Oracle load balancing and transparent application reconnect features, clients are completely insulated from the loss of a server resource or an Oracle instance failure on a node. To complement the high availability of the server cluster in a Windows environment, the Parallel Database Cluster integrates HP StorageWorks Secure Path for fully redundant access to the database in the even of any failure in SAN connectivity. Secure Path for Linux will be available at a later date. Combined, the Oracle clustering technology and HP platform technology deliver cost effective and highly available enterprise solutions for database applications.
For more specific information concerning configuration, interconnect options, and dual path software refer to the HP/Oracle site at http://h18000.www1.hp.com/solutions/enterprise/highavailability/oracle/index.html.

---

**HP OpenView Storage Mirroring**

HP OpenView Storage Mirroring (SM) is cost effective host-based software product for remote storage replication over IP networks. Storage Mirroring provides near real-time full application or file recovery up to the last byte replication. SM is an excellent choice for low bandwidth; low storage volume changes and meets business recovery goals within minutes or hours. The immediate return on investment is realized in the reduced management cost associated with branch or small offices networks.

- Supports Microsoft Windows 2000/2003 servers
- Application aware and supported with Exchange, SQL and Oracle
- Host-based remote replication for TCP/IP networks
- Data distribution one-to-many or 'fan-out' to multiple destinations
- Data migration utility for transferring large data projects
- Cost effective investment for a high return on business continuance
- Provides a cost effective solution to gain a competitive advantage position

For more information visit http://h18006.www1.hp.com/products/storage/software/sm/index.html

---

**HP Serviceguard for Linux Certification (to be supported in Q3 '04)**

HP Serviceguard for Linux is a high availability solution that leverages the strength of HP's experience in the HA business, bringing the best-in-class mission critical technologies to the Linux environment and ProLiant and Integrity servers. The kit includes high availability software that provides critical applications the high availability that enterprise customers require for 24x7 business operations. It is designed to protect applications from a wide variety of software and hardware failures, monitoring the health of each server (node) and quickly responding to failures including system processes, system memory, LAN media and adapters, and application processes.
Please refer to the Serviceguard for Linux web site for the latest information:
http://www.hp.com/servers/proliant/highavailability/serviceguard

*Service and Support, HP Care Pack and Warranty Information*

**Warranty**

Three-year Limited Warranty for MSA1500, Fibre Channel Cables and SFP Transceivers; 3 years parts exchange; 1 year labor; 1 year on-site; next business day response. Options for the MSA1500 carry their own warranty. In countries where available, your HP Limited Warranty includes Customer Self Repair warranty services. Please refer to HP's Limited Warranty Statement for further details:
http://h18006.www1.hp.com/products/storageworks/warranty.html

**Warranty Upgrade Options**

- Response - Upgrade on-site response from next business day to same day 4-hour response or 6 Hour Call To Repair
- Coverage - Extend hours of coverage from next business day to 9 hours x 5 days to 24 hours x 7 days
- Duration Select duration of coverage for a period of 1, 3, 4 or 5 years

**HP Care Pack Information**

- HP Care Pack is defined as an upgrade to the product warranty attribute, available for a specific duration and hours of coverage.
- HP CarePack is not available for less than the product's warranty duration.
- HP Care Pack is available for sale anytime during the warranty period for most products, but the commencement date will be the same as the Warranty Start Date (delivery date to end user customer). Proof of purchase may be required.
- HP Care Pack services are prepaid.

For additional information on Product Services and HP Care Pack, as well as orderable part numbers, please refer to the URL: http://www.hp.com/hps/carepack/.
If you have specific questions about availability or how to obtain services contact your local HP representative. Contact information for your local area can be found at:
http://welcome.hp.com/country/us/en/contact_us.html

**Software Product Services**

Product support provides the customer access to HP's experienced technical support resources, as well as access to HP's Information Services database for support on a variety of multi-vendor/multiplatform software products. Product support includes escalation and problem coordination with the appropriate engineering group. HP Services offer a variety of options to allow you to tailor your product service to meet the needs of your organization. Basic warranty on products can be uplifted from day one to ensure you receive the service you need when you need it.

**Warranty and support**

HP warrants only that the software media will be free of physical defects for a period of ninety (90) days from delivery.
The following services are offered as HP Care Pack Services at the time of software product order:

- Software Technical Support 24 x 7 (1 and 3 years) is available 24 hours per day, Monday through Sunday, including holidays (includes phone-in software technical support 24 x 7 and software product and documentation updates).
- Installation Service (software installation) and Installation and Startup Service (software installation, configuration, startup testing and knowledge transfer).
- HP Care Pack services must be ordered with the product and are prepaid.
- For tailored support contracts based on personalized statement of work contact your local support center via http://www.HP.com/support.

**Secure Path software services**

- Software product services included with Secure Path: One year of Software Technical Support 24 x 7 HP Care Pack Services (includes phone-in software technical support 24 x 7 and software product and documentation updates).
- HP Care Pack services are available to upgrade the one year of Software Technical Support 24 x 7 included with the Secure Path product to 3 full years.
- Installation service (software installation)

For additional software product services information for North American HP Care Pack services, as well as orderable part numbers, please refer to the URLs listed below:
All storage services: http://www.hp.com/hps/storage/.
All HP Care Pack Services: http://www.hp.com/hps/carepack/storage/cp_networked.html.
Software Support HP Care Pack Services: http://www.hp.com/hps/carepack/software/cp_storage.html.
Installation and Startup Services: http://www.hp.com/hps/storage/ns_implementation.html.
If you have specific service questions contact your local HP representative. Contact information for your local area can be found at: http://welcome.hp.com/country/us/en/contact_us.html
Maintenance releases, bug fixes and software patches are available at:
http://www.compaq.com/support/sanworks.

---

**Hardware Product Services**

- Installation services that include basic installation and Array Installation and Startup
- On-site maintenance (includes warranty support)
- Response time upgrades during the warranty period
- Post-warranty coverage or warranty extension
- RAID setup and performance consulting via statement of work
- Migration service consulting via statement of work
- Environmental, Mission Critical Services

For product services information for HP Care Pack services, as well as orderable part numbers, please refer to the URLs listed below:
All storage services: http://www.hp.com/hps/storage/.
All HP Care Pack Services: http://www.hp.com/hps/carepack/storage/cp_networked.html.
Installation and Startup Services: http://www.hp.com/hps/storage/ns_implementation.html.
If you have specific service questions contact your local HP representative. Contact information for your local area can be found at: http://welcome.hp.com/country/us/en/contact_us.html

---

**Array Installation and Startup Services**

The HP installation and startup for HP StorageWorks Disk Arrays service package provides installation and configuration of HP StorageWorks Disk Array products. Service highlights include:

- Service planning
- Installation and Startup provides installation, Virtual Disk Design and configuration of the MSA1500. This includes:
  - Service planning
  - Service deployment
  - Installation Verification Testing (IVT) required for this service
  - Customer orientation session
- Please contact your local HP sales organization for further details

---

**SAN Solution Service**

SAN Solution Service covers your entry-level disk array solution with:

- Comprehensive SAN implementation strategy and planning
- Hardware and software installation and configuration
- Integration of the installed disk array in your SAN environment
- Firmware verification
- SAN testing
- Solution handover to your staff

The Array Installation and Startup service is a pre-requisite for the SAN Solution Service.

For more information about he SAN solution service, please visit: http://www.hp.com/hps/storage/ns_san.html

---

| | | |
|---|---|---|
| **Hardware Care Pack Support Product Numbers** | **Fixed Price Care Pack Part Numbers** (Supported through all ordering systems): | |
| | 3 Yr next Day/Onsite | U6355A |
| | 3 Yr next Day/Onsite, Electronic | U6355E |
| | 3 Yr Same Day/Onsite | U6356A |
| | 3 Yr next Day/Onsite, Electronic | U6356E |
| | 3 Yr 7x24/Onsite | U6357A |
| | 3 Yr 7x24/Onsite, Electronic | U6357E |
| | 4 Yr Same Day/Onsite | U9398A |
| | 4 Yr Same Day/Onsite, Electronic | U9398E |
| | 4 Yr 7x24/Onsite | U9399A |
| | 4 Yr 7x24/Onsite, Electronic | U9399E |
| | 5 Yr Same Day/Onsite | U9400A |
| | 5 Yr Same Day/Onsite, Electronic | U9400E |
| | 5 Yr 7x24/Onsite | U9401A |
| | 5 Yr 7x24/Onsite, Electronic | U9401E |
| | 6 Hr. Call To Repair/Onsite | U9934A |
| | 6 Hr. Call To Repair/Onsite, Electronic | U9934E |
| | Hardware Installation | U4368A |
| | Hardware Installation, Electronic | U4368E |
| | **Flexible Care Pack Part Numbers** (Supported through Fusion ordering system only): | |
| | 1 Yr./3Yr. Next Day HW | HA101A1 |
| | 3Yr. Next Day HW | HA101A3 |
| | 1Yr./3 Yr. 4h 13x5 HW | HA103A1 |
| | 3 Yr. 4h 13x5 HW | HA103A3 |
| | 1Yr./3Yr. 4h 24x7 HW | HA104A1 |
| | 3Yr. 4h 24x7 HW | HA104A3 |
| | 1 Yr./3 Yr. Support Plus | HA109A1 |
| | 3 Yr. Support Plus | HA109A3 |
| | 1 Yr./3 Yr. Support Plus 24 | HA110A1 |
| | 3 Yr. Support Plus 24 | HA110A3 |
| | 1 Yr./3 Yr. Proactive 24 | HA111A1/3 |
| | 3 Yr. Proactive 24 | HA111A1/3 |
| | 1 Yr./3 Yr. Critical Service | HA112A1 |
| | 3 Yr. Critical Service | HA112A3 |
| | Installation - MSA | HA113A1 |

*Kit Contents*

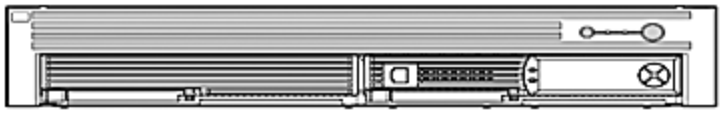
| Model Name | Kit Contents Description | Part Number |
|---|---|---|
| **MSA1500** | MSA1500 controller shelf, 1-controller, 1- FC module, 1- SFP transceiver, 1- dual channel SCSI I/O card, 2- power cables, redundant fans, redundant power supplies, universal rack-mounting kit, MSA1500 support CD and documentation, serial cable<br>**NOTE:** Fibre Channel cables, disk enclosures and hard drives are ordered separately. | AA986A |
| **MSA1500 with SATA** | 1- MSA1500 controller shelf base configuration, and 1-MSA20 SATA disk enclosure base configuration | AD509A |
| **MSA1500 with SCSI** | 1- MSA1500 controller shelf base configuration, and 1-MSA30 single-channel SCSI disk enclosure base configuration | AD510A |
| **MSA1500 upgrade shelf** | MSA1500 controller shelf, 1- FC module, 1- SFP transceiver, 1- dual channel SCSI I/O card, 2- power cables, redundant fans, redundant power supplies, universal rack-mounting kit, MSA1500 support CD and documentation, serial cable<br>**NOTE:** This MSA1500 upgrade shelf does not include a controller. It is intended for those customers who wish to upgrade from their MSA1000 to the MSA1500.<br>**NOTE:** When upgrading to the MSA1500, there is no space for the MSA1000 embedded switch or hub. | AD511A |

Include a narrative description of the configuration and related options.

## Step 1 - "Product" - Base Configuration

**Select one:**

| Model Name | Model Description: | Part Number |
|---|---|---|
| MSA1500 | MSA1500 controller shelf, 1-controller, 1- FC module, 1- SFP transceiver, 1- dual channel SCSI I/O card, 2- power cables, redundant fans, redundant power supplies, universal rack-mounting kit, MSA1500 support CD and documentation, serial cable | AA986A |



## Step 2 - Required Options (Must Choose Serial ATA or SCSI)

Select each required option with quantities specified.

| Description with Parts Shipped: | Quantity | Part Number |
|---|---|---|
| Dual Channel SCSI I/O Module (1 ships with base unit, 3 more can be added) | Up to 4 | AA988A |
| MSA20 - Serial ATA enclosure, SCSI cable, redundant fans and power supplies, power cable | Up to 8 | 335921-B21 |
| 160 GB Serial ATA hard drive, universal carrier | Up to 12 | 349238-B21 |
| 250 GB Serial ATA hard drive, universal carrier | Up to 12 | 349239-B21 |
| MSA30 - Dual Channel SCSI enclosure, SCSI cable, redundant fans and power supplies, power cable | Up to 2 | 302970-B21 |
| MSA30 - Single Channel SCSI enclosure, SCSI cable, redundant fans and power supplies, power cable | Up to 4 | 302969-B21 |
| 36.4 GB Pluggable Ultra320 Universal Hard Drive, 10,000 rpm (1") | Up to 14 | 286713-B22 |
| 72.8 GB Pluggable Ultra320 Universal Hard Drive, 10,000 rpm (1") | Up to 14 | 286714-B22 |
| 146.8 GB Pluggable Ultra320 Universal Hard Drive, 10,000 rpm (1") | Up to 14 | 286716-B22 |
| 36.4 GB Pluggable Ultra320 Universal Hard Drive, 15,000 rpm (1") | Up to 14 | 286776-B22 |
| 72.8 GB Pluggable Ultra320 Universal Hard Drive, 15,000 rpm (1") | Up to 14 | 286778-B22 |

**NOTE:** Two SATA disk enclosures can be attached to one SCSI I/O module. Only one SCSI disk enclosure can be attached to a SCSI I/O module.
**NOTE:** It is recommended that the same hard drive capacity (ex. All 250GB SATA in SATA enclosure or all 146GB SCSI in SCSI enclosure) be installed in a disk enclosure.
**NOTE:** All Ultra320 Universal Hard Drives are backward compatible to U2 or U3 speeds.
**NOTE:** For complete compatibility information, refer to the Compatibility table located at http://www.hp.com/go/msa1500cs

| Description | Quantity | Part Number |
|---|---|---|
| Power Cord, 110/220 VAC<br>**NOTE:** Shipped standard with all units. | 2 | 227099-001 |
| Power Cord, 220/240 VAC | 2 | 227099-002 |

**NOTE:** Redundant configurations require two Host Bus Adapters per server, an additional controller and fibre channel I/O module, and Secure Path software for each server.

## Step 3 – Choose Redundant MSA1000 System Options

| Description with Parts Shipped: | Quantity | Part Number |
|---|---|---|
| MSA Controller | 1 | 218231-B22 |
| 256 MB Cache Modules for Controller (one additional for each controller) | 2 | 254786-B21 |
| MSA1500 Fibre Channel I/O module | 1 | AA987A |
| HP StorageWorks Secure Path (appropriate for the operating system) | | |

**NOTE:** Redundant configurations require two Host Bus Adapters per server, an additional controller and fibre channel I/O module, and Secure Path software for each server.

## Step 4 – Choose Supported Options For 2 Gb Infrastructure

Select each required option with quantities specified.

| | Description with Parts Shipped: | Quantity | Part Number |
|---|---|---|---|
| **2 Gb Fibre Channel Fabric "B-Series" family of switches** | 2 Gb SFP SW Transceiver Kit | | 221470-B21 |
| | HP StorageWorks SAN Switch 2/8V | | AA979A |
| | HP StorageWorks SAN Switch 2/8V Power Pack | | AA980A |
| | HP StorageWorks SAN Switch 2/16V | | AA978A |
| | HP StorageWorks SAN Switch 2/16N | | AA990A |
| | HP StorageWorks SAN Switch 2/16N Power Pack | | AA977A |
| | HP StorageWorks SAN Switch 2/32 Power Pack Upgrade | | 313448-B21 |
| | HP StorageWorks SAN Switch 2/16 | | 322118-B21 |
| | HP StorageWorks SAN Switch 2/16 Power Pack | | 322119-B21 |
| | HP StorageWorks SAN Switch 2/16-EL | | 334181-B21 |
| | HP StorageWorks SAN Switch 2/8 Power Pack | | 322121-B21 |
| | HP StorageWorks SAN Switch 2/8-EL | | 322120-B21 |
| | **NOTE:** 8 and 16-port Switches (Trunking, Performance Monitor, remote switch, fabric watch, extended fabric). | | |
| **2 Gb Fibre Channel Fabric "M-Series" family of switches** | HP StorageWorks Edge Switch 2/32<br>**NOTE:** 16 active ports. | | 286810-B21 |
| | 8-FlexPort upgrade for Edge 2/32 | | 302660-B21 |
| | HP StorageWorks Edge Switch 2/24<br>**NOTE:** 8 ports active. | | 316095-B21 |
| | 8-FlexPort upgrade for Edge 2/24 | | 316096-B21 |
| | HP StorageWorks Edge Switch 2/12<br>**NOTE:** 4 ports active. | | 348406-B21 |
| | 4-FlexPort upgrade for edge 2/24 | | 348407-B21 |
| **2 Gb Fibre Channel Fabric "C-Series" family of switches** | Cisco MDS 9216 Multilayer Fabric Switch | | A7473A |
| | Cisco MDS 9120 Fabric Switch w/0 SFPs | | A7426A |
| | Cisco MDS 9140 Fabric Switch w/0 SFPs | | A7427A |
| | **NOTE:** For "C-Series" information refer to: http://hp.com/go/SAN | | |

| | | |
|---|---|---|
| **2 Gb Fibre Channel HBAs** | FCA2214 Host Adapter (Linux, Microsoft 32-bit ) | 281541-B21 |
| | FCA2214DC Host Adapter (Linux, Microsoft OS 32-bit) dual channel | 321835-B21 |
| | FCA2404 Host Adapter PCI-X (32-bit Windows) | 305573-B21 |
| | FCA2404DC dual channel Host Adapter PCI-X (32-bit Windows) | 323264-B21 |
| | Host Adapter for Windows Server 2003 64-bit, Integrity servers | AB232A |
| | Host Adapter for 64-bit Linux, Integrity servers | A6826A |

| | | |
|---|---|---|
| **Fibre Channel cables for 2 Gb Infrastructure** | Use 2 Gb Fibre Channel cables when connecting the MSA Fibre Channel I/O Module to FCA2101 HBA(s) | |
| | 2 m LC-LC Multi-Mode Fibre Channel Cable | 221692-B21 |
| | 5 m LC-LC Multi-Mode Fibre Channel Cable | 221692-B22 |
| | 15 m LC-LC Multi-Mode Fibre Channel Cable | 221692-B23 |
| | 30 m LC-LC Multi-Mode Fibre Channel Cable | 221692-B26 |
| | 50 m LC-LC Multi-Mode Fibre Channel Cable | 221692-B27 |

| | | |
|---|---|---|
| **Fibre Channel Cables for 1 Gb Fabric Switches and Hub** | Use 1 Gb Fibre Channel cables when connecting the MSA Fibre Channel I/O Module and FCA2101 HBA(s) to 1 Gb Fabric Switches or hubs. | |
| | 2 m LC-SC Multi-Mode Fibre Channel Cable | 221691-B21 |
| | 5 m LC-SC Multi-Mode Fibre Channel Cable | 221691-B22 |
| | 15 m LC-SC Multi-Mode Fibre Channel Cable | 221691-B23 |
| | 30 m LC-SC Multi-Mode Fibre Channel Cable | 221691-B26 |
| | 50 m LC-SC Multi-Mode Fibre Channel Cable | 221691-B27 |

## Step 5 – Choose Rack Options

Select each required option with quantities specified.

| | |
|---|---|
| 10647 (47U) Rack Cabinet - Pallet | 245160-B21 |
| 10647 (47U) Rack Cabinet - Crated | 245160-B23 |
| 10642 (42U) Rack Cabinet - Pallet | 245161-B21 |
| 10642 (42U) Rack Cabinet - Shock Pallet<br>**NOTE:** It is mandatory to use a shock pallet in order to ship racks with equipment installed | 245161-B22 |
| 10642 (42U) Rack Cabinet - Crated | 245161-B23 |
| 10636 (36U) Rack Cabinet - Pallet | 245162-B21 |
| 10636 (36U) Rack Cabinet - Shock Pallet<br>**NOTE:** It is mandatory to use a shock pallet in order to ship racks with equipment installed | 245162-B22 |
| 10636 (36U) Rack Cabinet - Crated | 245162-B23 |
| 10622 (22U) Rack Cabinet - Pallet | 245163-B21 |
| 10622 (22U) Rack Cabinet - Shock Pallet<br>**NOTE:** It is mandatory to use a shock pallet in order to ship racks with equipment installed. | 245163-B22 |
| 10622 (22U) Rack Cabinet - Crated | 245163-B23 |
| S10614 (14U) Rack Cabinet - Shock Pallet<br>**NOTE:** It is mandatory to use a shock pallet in order to ship racks with equipment installed. | 292302-B22 |
| 10842 (800 mm wide, 42U) Rack Cabinet - Pallet | 257415-B21 |
| 10842 (800 mm wide, 42U) Rack Cabinet - Shock Pallet<br>**NOTE:** It is mandatory to use a shock pallet in order to ship racks with equipment installed. | 257415-B22 |
| Rail Kit for mounting in a M-Series rack | 313877-B21 |

| | | |
|---|---|---|
| **MSA1500 to PDU** | 2.5m (8.2') 10A, IEC C 13 to IEC C14 PDU Jumper Cable (1 per pack) | 142257-002 |
| | 3.0m (9.8') 10A, IEC C 13 to IEC C14 PDU Jumper Cable (1 per pack) | 142257-003 |
| | 1.4m (4.5') 10A, IEC C 13 to IEC C14 PDU Jumper Cable (1 per pack) | 142257-006 |

## Step 6– Choose HP Care Pack Services

| | |
|---|---|
| 9x5 Next Business Day, Onsite Coverage, 3 years (6-3) | 103840-002 |
| 9x5 Next Business Day, Onsite Coverage, 3 years (2-5-2) | FM-FCXHW-36 |
| 9x5, 4-Hour Response, On-Site Coverage, 3 years (6-3) | 402165-002 |
| 9x5, 4-Hour Response, On-Site Coverage, 3 years (2-5-2) | FM-FC4HR-36 |
| 24x7, 4-Hour Response, On-Site Coverage, 3 years (6-3) | 402164-002 |
| 24x7, 4-Hour Response, On-Site Coverage, 3 years (2-5-2) | FM-FC724-36 |
| 9x5, Next Business Day, On-Site Coverage, 5 years (6-3) | 170183-002 |
| 9x5, Next Business Day, On-Site Coverage, 5 years (2-5-2) | FM-FCXHW-60 |
| 9x5, 4-Hour Response, On-Site Coverage, 5 years (6-3) | 170185-002 |
| 9x5, 4-Hour Response, On-Site Coverage, 5 years (2-5-2) | FM-FC4HR-60 |
| 24x7, 4-Hour Response, On-Site Coverage, 5 years (6-3) | 170187-002 |
| 24x7, 4-Hour Response, On-Site Coverage, 5 years (2-5-2) | FM-FC724-60 |
| Hardware Installation (6-3) | 402162-002 |
| Hardware Installation (2-5-5) | FM-FCINS-IN |

## *Related Options*

| | | |
|---|---|---|
| **Storage Virtual Replicator v4.0 (Microsoft operating systems)** | 1 license | 261770-B22 |
| | 3 license | 266236-B22 |
| | 5 license | 261775-B22 |
| | 10 licenses | 261771-B22 |
| | 25 licenses | 261772-B22 |
| | 50 licenses | 261773-B22 |
| | Base Media and Documentation Kit (license required) | 261769-B24 |
| **Secure Path v4.0C for Windows Workgroup Edition (including Windows Server 2003/32-bit and 64-bit)** | Secure Path v4.0C for Windows Workgroup one license | 213076-B26 |
| | Secure Path v4.0C for Windows Workgroup Edition five licenses | 231316-B26 |
| | Secure Path v4.0C for Windows Workgroup Edition 10 licenses | 231317-B26 |
| | Secure Path v4.0C for Windows Workgroup Edition 25 licenses | 231318-B26 |
| | Secure Path v4.0C for Windows Workgroup Edition 50 licenses | 231319-B26 |
| | Secure Path v4.0C for Windows Workgroup Edition Upgrade License | 261715-B24 |
| | Secure Path v4.0C for Windows Workgroup Edition for ProLiant BL line 8 licenses | 325634-B23 |
| | **NOTE:** At present 64-bit Windows with Secure Path can operate in a homogenous configuration of multiple (up to 5) 2-node clusters. This requires MSA1000 firmware version 4.24 and Secure Path V4.0C or later. | |
| | **NOTE:** Refer to http://www.hp.com/go/securepath for the latest Secure Path parameters for Windows. | |
| **Secure Path v3.0C for Linux Workgroup Edition** | Secure Path v3.0C for Linux Workgroup Edition one license | T3581A |
| | Secure Path v3.0C for Linux Workgroup Edition five licenses | T3582A |
| | Secure Path v3.0C for Linux Workgroup Edition 10 licenses | T3584A |
| | Secure Path v3.0C for Linux Workgroup Edition 25 licenses | T3585A |
| | Secure Path v3.0C for Linux Workgroup Edition 50 licenses | T3586A |
| | **NOTE:** Refer to http://www.hp.com/go/securepath for the latest Secure Path parameters for NetWare | |

**Qlogic Failover Driver for Linux**

Provides a single multi-path solution for Linux

- Qlogic driver version 7.00.03 for Red Hat Linux v3.0 U1
- Supported on HP FCA2214 (281541-B21); FCA2214DC (321835-B21) and HBA for 64-bit Linux, Integrity Servers (A6826A) Host Bus Adapters
- Offers static load balancing

For more information visit http://www.qlogic.com or http://h18006.www1.hp.com/products/sanworks/multipathoptions/index.html

| | | | | |
|---|---|---|---|---|
| **Modular Smart Array 1500 cs** | **LED Indicators on Front** (4) | System heartbeat | | |
| | | System UID | | |
| | | Power On/Standby | | |
| | | Fault detected in enclosure | | |
| | **LED Indicators on Rear Panel** (7) | System UID | | |
| | | SCSI Module Power indicator (1 per SCSI I/O module) | | |
| | | SCSI Activity (1 per SCSI I/O module) | | |
| | | Fibre Channel I/O card status (1 per Fibre I/O module) | | |
| | | Fibre channel link status (2 per Fibre I/O module) | | |
| | | Power supply status (1 per power supply) | | |
| | | Fan Module status (1 per fan module) | | |
| | **Interface** | Ultra3 SCSI to Hard Drives | | |
| | | 2 Gb Fibre Channel to Hosts | | |
| | **Maximum Number of Drives** | 96 SATA hard drives in 8 MSA20 SATA enclosure or 56 SCSI hard drives in 4 MSA30 enclosures | | |
| | **Temperature Range** | **Operating** | 50° to 95° F (10° to 35° C) | |
| | | | -22° to 122° F (-30° to 50° C) | |
| | **Relative Humidity** | **Operating** | 10% to 90% | |
| | | **Non-operating** | Up to 95% | |
| | **Input Power Requirements** | **Rated Input Voltage** | 100 to 240 VAC | |
| | | **Rated Input Frequency** | 47 to 63 Hz | |
| | | **Rated Input Current** | 6.4A Max, 1A typical | |
| | | **Input Power** (max) | 400W Max, 95W typical | |
| | | **NOTE:**Input Power and Heat Dissipation specifications are maximum values and apply to worst-case conditions at full rated power supply load. The power/heat dissipation for your installation will vary depending on the equipment configuration. | | |
| | **MSA1500 Controller Shelf** | 2U Rack Form Factor | **Dimensions** (H x W x D) | 3.46 x 19.06 x 24.32 |
| | | | **Weight** | 55 lbs |
| | | **Shipping Packaging** | **Dimensions** (L x W x D) | 32.50 x 11.25 x 34.06 |
| | | | **Weight** (Gross) | 68 lbs |
| | **SCSI I/O Module** (Position in shelf) | | **Dimensions** (H x W x D) | 3.2 x.92 x 14.62 |
| | | | **Weight** | 1.01 lbs |
| | | **Shipping Packaging** | **Dimensions** (H x W x D) | 19.88 x 9.06 x 2.76 |
| | | | **Weight** (Gross) | 1.93 lbs |
| | **Fibre Channel I/O Module** (Position in shelf) | | **Dimensions** (H x W x D) | 3.2 x .92 x 14.62 |
| | | | **Weight** | .96lbs |
| | | **Shipping Packaging** | **Dimensions** (H x W x D) | 19.88 x 9.0 6x 2.76 |
| | | | **Weight** (Gross) | 1.87lbs |
| | **User Interface** | Controller display with Status Indicators (2) and push buttons (4) on front of controller | | |
| | **Electrical Interface** | LVD (Low Voltage Differential) | | |
| | **Protocol Support** | Wide Ultra3 SCSI | | |
| | **SCSI Ports** | 2-ports per SCSI I/O card, up to 4 cards total | | |
| | **Maximum Capacity** | 24 TB with 96- 250 GB SATA HDD, or 8.1 TB with 56-146 GB SCSI HDD | | |
| | **Logical Drives** (LUN) | Up to 32 Logical Drives | | |
| | **Maximum Logical Drive size** | 2.0 TB | | |

| | | | |
|---|---|---|---|
| **Modular SAN Array 1000 Controller** | **User Interface** | Controller Display with Status Indicators (2) and Push Buttons (4)<br>Status Indicators on front of Controller (16) | |
| | **Electrical Interface** | LVD (Low Voltage Differential) | |
| | **Protocol Support** | Wide Ultra3 SCSI (160 MB/s per channel) | |
| | **RAID Support** | RAID ADG (Advanced Data Guarding) | |
| | | RAID 5 (Distributed Data Guarding) | |
| | | RAID 1 (Mirroring) | |
| | | RAID 0 (Stripping) | |
| | **Cache Memory** | Up to 512 MB Read/Write (256 MB modules). If redundant controllers are used they must have equally configured cache | |
| | | ECC protection, battery-backed, and removable | |
| | | Standard as of November 19, 2002: 256 MB cache memory (single module) | |
| | **Cache Batteries** | Up to three days of redundant battery life, removable for easy replacement | |
| | **Upgradeable Firmware** | 2 MB flashable ROM | |
| | **Disk Drive and Enclosure Protocol Support** | HP Ultra 320, Ultra3, and Ultra2 SCSI 1-inch Universal drives | |
| | **Packaging** | **Dimensions** (L x W x D) | 15.5 x 12.0 x 3.25 |
| | | **Weight** (Gross) | 2.5 lb |

| | | | |
|---|---|---|---|
| **Modular SAN Array Fibre Channel I/O Module** | **Connector Type** | LC | |
| | **Number of Fibre Channel Ports** | One 2 Gb Fibre Channel Port using removable Small-Form-Factor-Pluggable Transceiver (SFP) | |
| | **Bandwidth** | 200 MB/s | |
| | **Operation Modes** | Fibre Channel Class 2 and 3 connectionless service | |
| | **Protocols Supported** | Fibre Channel | |
| | **Packaging** | **Dimensions** (L x W x D) | 19.88 x 9.06 x 2.76 |
| | | **Weight** (Gross) | 1.87 lbs |

| | | | |
|---|---|---|---|
| **Multi-Mode Fibre Channel Cables Kits** (218960-B21) | **Cable Type** | LC-LC (2 Gb to 2 Gb connections) and LC-SC (2 Gb to 1 Gb connections) 50 Micron multi-mode Fiber | |
| | **Available Cable Lengths** | 6.5 ft, 16.4 ft, and 49.2 ft (2 m, 5 m, and 15 m) | |
| | **Packaging** | **Dimensions** (L x W x D) | 11.5 x 9 x 1.5 in (29.2 x 22.8 x 3.8 cm) |
| | | **Weight** (Gross) | 0.75 to 1 lb (0.34 to 0.45 kg) |

© Copyright 2004 Hewlett-Packard Development Company, L.P.

The information contained herein is subject to change without notice.

Microsoft and Windows NT are US registered trademarks of Microsoft Corporation. Intel is a US registered trademark of Intel Corporation. Unix is a registered trademark of The Open Group.

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.